

IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF PENNSYLVANIA

UNITED STATES OF AMERICA)	
)	
v.)	Criminal No. 19-369
)	
LAFON ELLIS)	

Declaration of Nathaniel Adams and Jeanna Matthews

We, Nathaniel Adams and Jeanna Matthews, declare that we have personal knowledge of the following, and if called upon to do so, could and would testify competently to the matters contained herein.

I. Qualifications

1. We have written prior declarations for this case which are dated July 16, 2020; February 16, 2021; March 22, 2021; and March 25, 2021. Our qualifications are listed in more detail therein.

II. Overview

1. We have been asked by attorney Khasha Attaran to describe the inspection of TrueAllele source code and associated software engineering materials in this case.
2. On August 18-20, 2021, Nathaniel Adams was provided in-person access to two computers – one containing an executable copy of TrueAllele and a second containing the source code of TrueAllele. However, Cybergenetics has not provided key materials “in a format allowing it to be reasonably reviewed, searched and tested” as specified in the protective order issued on July 23 2021. To explain why, we will elaborate on some of the technical details below, but would like to begin with an analogy. TrueAllele has been a black box system. Of the two computers provided by Cybergenetics, the first, the one with an executable copy of TrueAllele and internet access, is still a black box. We cannot examine

the inner workings of the executable system on that computer. The second computer is not a black box. Instead, it is a box filled with many small parts that are used in the building of TrueAllele. Imagine a box filled with an engine pulled apart into tiny parts – washers, bolts, pulleys, grommets, belts, valves and more – all mixed together, without schematics or instructions for how to construct the engine. Furthermore, we have reasons to believe that we *cannot* build a working version of TrueAllele because not all the necessary parts (“dependencies”) are present (e.g. databases needed to run TrueAllele are missing). We intend to conduct a reasonable review, which is the ability to see inside the black box in order to inspect the contents of the working system. That access, via relevant software engineering materials including dependencies and build process documentation, has not been made available to us.

III. Technical Details

3. On August 18-20, 2021, Nathaniel Adams was provided in-person access to a Windows 10 laptop containing the MATLAB Integrated Development Environment (IDE), the Notepad++ text editor, the grepWin search utility, and thousands of TrueAllele MATLAB source code files. However, no build instructions were provided to enable us to produce a working executable from those source code files.
4. As described in our March 22, 2021 declaration, build environment, materials, and instructions are relevant to our review and testing of software in general, including the TrueAllele software used in this case. Build instructions fall within “Software engineering and development materials describing the development, deployment of TrueAllele” and are used for inspecting and testing the source code. In order to confirm that the source code provided produces the TrueAllele software as it operated in this case, we must be able to build a functionally identical (if not entirely identical) version of TrueAllele from the

source code provided. This requires build instructions.

5. Inspections of software, including during software testing, involve execution of all or part of the system with the assistance of a tool or utility that allows line-by-line execution of the source code and examination of the program state before and after execution. Called a “debugger,” this tool is invaluable for tracing execution paths of source code in order to observe dynamic software behaviors, such as when investigating how a component works or why a component failed a particular test case.
6. “Software testing” is an expansive concept addressed by various software verification and validation tasks. Testing activities involve testing different aspects of a software system at various levels of granularity (e.g. unit tests, component tests) and for different purposes (e.g. verification against specifications or user acceptance). For example, “unit testing” tests the smallest testable component of a software program against that component’s specification and involves access to the source code, executing that code with a given set of inputs in order to evaluate the code’s behavior or output. Units of code dependent on other code, entire other programs, databases, or other resources (i.e. dependencies) that are not available during the testing process are non-functional and cannot be tested as units. Execution paths of the whole system encountering units with unsatisfied dependencies often result in irrecoverable error states (“crashes”), as they did in during the August 18-20, 2021 inspection because key components are missing.
7. As provided on August 18-20, 2021, TrueAllele cannot be run on the source code inspection PC as an executable since build instructions and dependencies such as databases were not included. Nor could the code be inspected via a debugger for system-level or many unit-level inspection and testing activities because dependencies such as databases

were not included. Missing dependencies such as databases resulted in error states when attempting to run the TrueAllele source code provided, preventing system-level testing and many unit-level tests from being initiated and preventing execution path tracing from being conducted.

8. Past inspections of the probabilistic genotyping software programs Forensic Statistical Tool and STRmix by Nathaniel Adams involved the provision of build configurations and dependencies sufficient to establish functional equivalence between the source code provided for inspection and the versions of the programs used in their respective cases. The source code was operable within an IDE, enabling dynamic testing and execution tracing (via a debugger) for review purposes.

IV. Conclusion

9. The form and materials on the source code inspection PC examined by Nathaniel Adams on August 18-20, 2021 do not allow for routine software inspection and testing tasks to be conducted on the TrueAllele source code provided.

September 1, 2021



Nathaniel Adams, Dayton, Ohio



Jeanna Matthews, Ph.D., Potsdam, New York